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GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Meetings of December. An inter-monthly meeting of the American Geographical Society was held on Tuesday evening, December 12, 1916, at the Engineering Societies' Building, 29 West Thirty-ninth Street. President Greenough presided. The lecture for the evening was entitled ''The Argentine Pampas,'' by Charles Wellington Furlong, F.R.G.S. Mr. Furlong related his experiences on a journey across southern Patagonia from the Atlantic to the Andes. He also described the life of the Tehuelches, the Indians of that region, and the Onas, who inhabit Tierra del Fuego. These and other Fuegian peoples are dealt with in the article by Mr. Furlong in the present number.

The regular monthly meeting was held on December 26. President Greenough presided. He submitted for confirmation the names of 532 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Mr. Arthur Stanley Riggs delivered a lecture entitled ''Colonies, Old and New.''

NORTH AMERICA

A Proposed 30-Mile Tunnel under the Cascade Mountains. The Cascade mountain wall which divides eastern and western Washington has proved a barrier to the development of Puget Sound as a Pacific terminal for continental traffic. At various times in the past ten years, rail traffic across the Cascades has been stopped completely in winter by the heavy snowfall for periods of one to three weeks, and grave accidents and loss of life have occurred through avalanches. A plan to conquer this natural obstacle more adequately than at present is set forth by Brigadier-General H. M. Chittenden in *Engineering News* for November 16, 1916 (pp. 928-935). It involves the building of a tunnel about thirty miles long between the valleys of the Wenatchee and Skykomish. This is practically the route at present followed by the Great Northern Railway, which pierces the crest between the headwaters of the two rivers in the Cascade Tunnel, 13,500 feet long and 3,375 feet above sea level. The tunnels by which the two other railroad crossings of the range are effected lie farther south: the Snoqualmie Pass Tunnel, used by the Chicago, Milwaukee, and St. Paul Railway, 11,890 feet long and 2,560 feet in elevation, and the Stampede Tunnel, used by the Northern Pacific Railway, 9,834 feet long and 2,837 feet above sea level (for these routes see map in *Bull. Amer. Geogr. Soc.*, Vol. 43, 1911, p. 520).

The Wenatchee-Skykomish route is considered the most advantageous because these two opposite-flowing rivers lie almost in a straight line and also because this route crosses the range at a point where it is restricted by the westernmost projection of the Columbia Plateau. Instead of having to climb to the present tunnel elevations of 2,500-3,400 feet, the trains in the proposed line would never rise more than 1,200 feet above sea level and the maximum gradient would be reduced from 2.2 to 0.6 per cent.

In its technical aspect, the construction presents no difficulties which modern engineering cannot surmount. The cost is estimated at $50,000,000, and the time required for the completion, from five and a half years to thirteen according to the method adopted.

A comparison with the length of tunnels in the Alps is of interest. The great European mountain mass is pierced by five tunnels: Mont Cenis, length, 8 miles; Saint Gotthard, 9.2 miles; Arlberg, 6.5 miles; Simplon, 12.3 miles; Loetschberg, 9 miles.

The Exploitation of Potash in Nebraska. Jesse Lake, near Alliance on the western margin of the sand hills region of Nebraska, is acquiring fame as the site of a new American industry, the production of potash salts on a commercial scale. The industry's plant is said to be the first of its kind in North America (Victor Ziegler: The Potash Deposits of the Sand Hills Region of Northwestern Nebraska, *Colorado School of Mines Quarterly*, October, 1915; compare the note on the ''Potash Resources of the United States'' in the March, 1916, *Review*, p. 217). Salts extracted from the brine-saturated sand underlying the lake are used in the manufacture of fertilizers, and concentrated brine is also shipped to Michigan for use in the treatment of magnesia brines. Jesse Lake is one of the most strongly alkaline of the many lakes that are found on the pitted, wind-scoured surface of the sand hills region. The majority of the lakes are fresh or only slightly alkaline, but the waters of a small proportion are sufficiently mineralized to merit commercial consideration. Most of these are small, the average area being perhaps 100 acres. Jesse Lake is one of the larger members:

it has an area of 240 acres, and its saline content is estimated at something over 100,000 tons.

The origin of the Nebraskan deposits is attributed to human interference with the original plant cover. Before white occupation the Indian population had burned over the prairie and extensive woodland and exposed the surface to the erosive influences of a semi-arid climate. Mineral ashes from the destroyed vegetation washed into the waters that collected in the wind-hollowed depressions. Where an outlet was lacking the waters, subject to intense evaporation, became rapidly enriched in saline content. In the case of the alkali lakes properly so-called the total salts averages 4 to 6 per cent, a commercially workable amount if the extent of the deposit is sufficiently great.

Bureau of Soils Publications as Geographic Material. In the *Field Operations* and soil maps issued every year by the Bureau of Soils of the U. S. Department of Agriculture students of geography may find a rich and rapidly growing stock of new source material.

When the mapping of each unit area, usually a single county, is completed a report on it is issued in booklet form. The distinctive feature of the reports is the accompanying map of the soil types in a color overprint upon a very accurate base map in black and white on the scale of one mile to the inch. Annual volumes comprising the fifty or more booklets put out during the year are also obtainable.

To illustrate the method of treatment in each areal discussion and to exhibit the wealth of geographic material in these reports, that on Will County, Illinois (as found in the *Field Operations of the Bureau of Soils for the Year 1912*, pp. 1521-1553) is here discussed in some detail.

In the field of place geography, the report describes the drainage and its relation to the great waterways, the Mississippi and St. Lawrence systems; the location of the area with reference to state boundaries and physiographic region lines, and to the main features of the continental glacier; its position with reference to trade routes, waterways, railroads, and to the large cities.

In the field of economic geography, the uses of the streams, for power, navigation, water supply, and scenic points are discussed. Railroads, canals, and wagon roads are described. The condition of the roads and facilities for improving them, supplies of gravel, stone, and clay for brick roads are treated.

From the climatic side not only the bare statistics of averages, means, and extremes are given, but dates of killing frosts, length of growing season, distribution of precipitation through the year and in relation to the growing season, "dry spells," probability of hail and other destructive storms, and the temperature extremes in their relation to certain crops. Then comes the rainfall in relation to run-off, soil absorption and evaporation, and floods.

From the historic viewpoint are discussed the original condition as to forests, grass, game, fish, and travel, together with their relation to early settlement and development and the present culture.

Causal relations are kept well to the front. Soil types are placed and correlated with glacial and rock features and post-glacial processes. Their origin and character are carefully worked out, and their present uses and possibilities are connected with their history. The need of underdraining, facilities therefor, and materials for making drain tile are considered. Topography is not only treated descriptively, but is explained; abandoned lake beds, beaches, and moraines are located and their relation to the soils and crops is defined. The effects of both soils and topography upon the people, their distribution, occupations, and wealth are interpreted. The relation of this area to other areas and to Chicago and other markets is shown; its development is correlated with theirs.

Even the element of prognostic geography is included, in suggesting new uses for the soils and slopes, and new adjustments that can be made both to the advantage of the county and its people and also to the city markets.

Each areal report is similarly informing and stimulating. George D. Hubbard.

The Forests of Porto Rico. Originally as well-wooded as the neighboring Santo Domingo, of whose area 85 per cent is still under virgin forest, Porto Rico is fast running through its reduced woodland resources. Only two per cent of the surface is "high" forest (tropical rain-forest), and, with the so-called "timber and brush" lands, the total of woodland is not more than 20 per cent. Yet the country is consuming annually three times as much as it produces. At such a rate depletion will be complete in less than a score of years. This condition is attributable in the main to the density of population: Porto Rico has 235.5 people to the square mile where Santo Domingo has only 33.

In the removal of the forests organized lumbering has played no part. Clearing for agricultural purposes and charcoal burning are almost solely responsible for the denudation. The wasteful system of primitive tropical agriculture has been particularly harmful to the forests. The same spot is seldom cultivated for more than three years in succession; then another patch, preferably of virgin forest of the better type, is burned out. On the abandoned clearings grass, chaparral, or a savanna formation often compete successfully with secondary forest. Thus has originated much of the so-called pasture of little use even for stock. The total area under pasture occupies 47 per cent of the island. On the contrary the acreage devoted to commercial crops at the expense of the forest is economically justified. Sugar occupies the level, agricultural lowlands, and coffee, which grows best on steep slopes above 2,000 feet, conserves the soil cover to a great extent.

Of the original tropical rain-forest only three considerable tracts remain: that of the Sierra de Luquillo on the east and two smaller areas on the center and west center of the island cordillera. The virgin forest of Luquillo has been protected from man by the steepness of its wind- and rain-swept slopes. Part of it has been created a government reserve. Most of the remaining government land is in the grass and brush region. Afforestation could be put into practice here, but, as the extent is not great, co-operation with the land owners must form the basis of a sound forest policy. Such a proceeding, however, will be difficult, for most of the mountain holdings are small (Louis S. Murphy: Forests of Porto Rico, Past, Present, and Future, *U. S. Dept. of Agric. Bull. No. 354,* 1916).

Central American Railroads. The growth of railroad enterprise in Central America is the subject of a pertinent article in the International Edition of *Dun's Review* for October, 1916. The earliest line was that built across the Isthmus of Panama under the stimulus of the Californian gold discoveries. Begun in 1850, this short ocean-to-ocean line was only opened to traffic in 1855, after a tremendous expenditure of human life. The present line does not follow the first surveyed locations, as it has been rebuilt in parts on new rights-of-way. A new line which will eventually connect David in the southwestern part of the republic with Empire in the Canal Zone is now under construction.

North of Panama, in Costa Rica, transcontinental travel between Punta Arenas and Puerto Limon is made possible through the connection at San José of the Pacific and the Northern Railways. In Nicaragua, Leon and the important cites of Managua and Granada are connected with the Pacific ocean at Corinto. For some years proposals have been under discussion to complete transportation facilities to the Atlantic. The April, 1916, number of the *Bulletin of the Pan American Union* reports that the Pacific Railroad Company has submitted to the Nicaraguan congress a project for construction of a line between Managua and Bluefields. Salvador as yet has no means of direct communication with the Atlantic: completion of the construction undertaken by the International Railways of Central America will, however, make connection with their transcontinental road in Guatemala. This last-named line, the northernmost of the three transcontinental connections in Central America, unites Puerto Barrios on the Atlantic with the principal Pacific harbors of the republic. Here, as well as in the other republics of Central America, the main centers of activity are situated on the west coast, and railroad building has consequently progressed more rapidly on this side.

In addition to these lines many miles of plantation railways are operated by the large companies which have played an important part in the development of Central America. Over 250 miles of these lines, belonging to the United Fruit Company, are in operation in Panama alone, while on the Atlantic side of Costa Rica a network comprising 170 miles of track is owned by and operated by the same company. In Honduras this prosperous concern runs over 161 miles of plantation railways.

SOUTH AMERICA

Human Life in the Flood Region of Lowland Bolivia. A brief but interesting description of the lowland region of eastern Bolivia is given by the ethnologist Erland Nordenskiöld in a recent paper ("Die Anpassung der Indianer an die Verhältnisse in den Überschwemmungsgebieten in Südamerika," *Ymer,* 1916, No. 2). A valuable map shows the outlines of the area so extensively flooded each year during times of high water. It lies between the Andes and the Guaporé and extends northwestward to the Madidi and southeastward to the belt of higher country northeast of Santa Cruz.

Here is a region of great extremes. At times of low water the inhabitants may be required to dig to ground-water and in times of high water the same people may be able to travel only by canoe. The extensive inundations push the edges of cultivation to the higher ground and flood hundreds of villages. Even such a large town as Trinidad is not immune, for it is said that it has but one street which has not been submerged. The rainy season begins in October, November, or December and continues until April or May, but it is not until late December or early January that the pampas are flooded sufficiently to interfere with trade.

The point of chief interest lies in the description of the numerous canals which connect the rivers and their main tributaries. By means of these canals one may cut across country in many places, thus saving long detours. The author inclines to the view that these canals are not natural features but are artificial products associated with Arawak culture. The inquiry is extended to other regions of the Amazon basin; for example, north to the Casiquiare, thence to the Orinoco and the Rio Negro. He gives a small-scale map of the region. Here again is a field of Arawak culture. The point raised is extremely interesting, and more refined hydrographic studies are now required to advance any argument in support of a natural origin for the connecting canals.

The Argentine Census of 1914. The United States consul at Rosario reports briefly on the first published returns of the Argentine census taken in 1914 (*Commerce Repts.*, No. 250, Washington, 1916). Argentina is now credited with a total population of 7,885,237, practically double that of the preceding census of 1895. The greatest growth is shown in the vine-growing Andean province of Mendoza, where the increase is 139 per cent. Large increases are also recorded in the provinces of the wheat belt. For the country as a whole the population density is 7 per square mile. Tucumân, with 40 inhabitants to the square mile, remains the most densely peopled province. Of comparatively small extent, it embraces a large proportion of plains-country well adapted to the sugar cultivation upon which its prosperity depends. Catamarca, lying immediately to the west and occupied by plateau and cordillera, has, on the contrary, less than 3 to the square mile. Misiones, with 5 to the square mile, has by far the greatest density of the National Territories. Much interest attaches to the statistics in regard to nationality, for thirty per cent of the population is foreign. This is a topic that will be discussed in a later issue of the *Review.*

Physical Changes during Historic Time in the Rio de la Plata Estuary. Within the last four hundred years important physiographic and biologic changes have taken place in the basin of the Rio de la Plata (Aníbal Cardoso: El Río de la Plata desde su génesis hasta la conquista, *Anal. del Museo Nacional de Hist. Nat. de Buenos Aires,* Vol. 27, 1915). The early explorers left us little in the way of detailed geographical description. Broadly they picture the shores of the great estuary from Montevideo on the east to Buenos Aires on the west covered with woods and thickets where abounded the jaguar and puma. Beyond the riverine bluffs of the west the Querandíes engaged in the pursuit of deer, guanaco, and the wild horse. In similar fashion the Charruas occupied the eastern country, whilst the friendly and pacific Guaraníes cultivated the islands of the delta. References to hydrography are few, but we glean enough to appreciate the practical importance of the changes that have transpired since the discovery of the estuary.

The exact date of the discovery remains doubtful. The first authenticated entry is that made by Juan de Solis in 1516, but it is a commonly held opinion that he effected an early voyage "in secret." Solis confined his exploration to the Banda Oriental; subsequent navigators crossed over to the western shore. Magellan, who appears to have reached the neighborhood of the modern La Plata, sailed the estuary at a speed precluding the idea that he had to feel his way by soundings. Cabot passed from the Uruguayan coast to the river Las Palmas without difficulty. The reports on his voyage are amongst our most valuable sources. They include the map showing the site of Sancti Spiritu, the first and only town in La Plata before 1536; the diary of one of his soldiers, Luis Ramirez; and the memoir of his rival, Garcia. A little later Pedro de Mendoza, founder of the first settlement of Buenos Aires, likewise crossed without trouble from Colonia to the playa on which he laid out his ill-fated colony. As late as the end of the sixteenth century this unimpeded navigation along the western shore was the experience of the largest vessels of the time. Useful data on the condition of the estuary are found in the log of a Dutch boat sailing to the La Plata in 1599. (This log in original form and as a Spanish translation is to be found in the *Anales de la Biblioteca: Publicación de Documentos relativos al Río de la Plata,* Vol. 4, Buenos Aires, 1905.)

These early observations, in harmony with physiographic evidence, suggest that with comparatively little labor and expenditure the ancient channels might be restored and vast improvement effected in navigation of the Argentine side of the upper estuary, at present only available for boats of small draft. The most direct route to the Paraná follows the channel of the Rio de las Palmas, but the bar near the mouth closes it to vessels drawing nine feet or more. Projects to canalize this waterway to Buenos Aires have long been under consideration. A year or two ago the Argentine Senate granted a concession for the construction of the Mitre Canal, as it is called. Alternative schemes and a plan of existing and proposed routes may be found in a paper by Agustín Mercau (Canalización Artificial del Río de la Plata, *Anales de la Soc. Científica Argentina*, Vol. 62, Buenos Aires, 1906).

EUROPE

Revival of the English Channel Tunnel Project. The European war has created a revival of interest in the project of a tunnel under the English Channel. The *Engineering Record* for November 25, 1916, reproduces an article (pp. 645-646) contributed by A. Dumas in *Le Génie Civil* for October 21, 1916, in which the estimated cost of the tunnel is set at $77,000,000. Yet it is believed that the venture would prove immediately profitable. According to conservative reckoning, fifteen freight and passenger trains pulling an average load of 500 tons could be operated daily in each direction. It is estimated, however, that during the war 144 troop trains a day could be operated in one direction. An important saving would be accomplished by eliminating the present transfers between rail and water. The scheme has the great advantage of reducing the running time between London and Paris by 5½ hours, thus bringing the two capitals as close together as New York and Boston.

The plan calls for the building of twin, single-track tunnels. Only 37 miles of track are required to provide connections with the Paris-Calais and London-Dover railways. Of this distance 32 miles would be actually under water. Geological conditions appear to be favorable to tunnel construction. Its course will be laid in a highly impervious bed of argillaceous chalk (Cenomanian), which shows closely similar outcrops on either side of the channel. These outcrops determine the points of departure from the respective shores, Sangatte, north of Cape Blanc Nez, and Shakespeare Cliff south of Dover.

As is well known the scheme is by no means new. It was suggested in Napoleon's time and seriously considered before the mid-century, since when French engineers have always been interested in the venture, although considerable opposition has been met with on the British side. In 1875 a French company obtained a ninety-nine year franchise and constructed a tunnel over a mile in length from the French shore before matters reached a deadlock in 1882. This work, as well as a corresponding section at the English end built about the same time by the Channel Tunnel Company, is now available.

The *Engineering Supplement of the London Times* (August 25, 1916) discusses the tunnel scheme in relation to other solutions of cross-channel communication without transshipment—that is, apart from aircraft, by bridge or train ferry.

Iron Mining in Normandy. By the revival and new development of its iron mining, Lower Normandy, commonly regarded as a purely pastoral and agricultural region, bids fair to experience an industrial revolution not unlike that which took place in French Lorraine a quarter of a century ago. Present operations are centering around Caen, the chief port of shipment for the mine products and of entry for the imported fuel. The recrudescence of what is here a very ancient industry began with the introduction of German capital in 1909. According to the British Consul-General at Havre (*Board of Trade Journ.*, Oct. 19, 1916) the output in 1900 was only 142,000 metric tons: now, with the mines under government control, it is over 1,000,000 metric tons and is being steadily augmented. The progress of the industry is described in the article "El Fierro en Normandía" in the Chilean mining publication *Boletín de la Sociedad Nacional de Minería* (Vol. 27, Ser. 3a, No. 219, Santiago, 1915).

The Revolution in Russian Agriculture. Since the liberation of the serfs in 1861 the dominant form of land cultivation in central and eastern, especially northeastern, Russia has been the communal system. The system is a natural one in a vast, undeveloped region sparsely peopled and without capital, but it limits agriculture to a low standard. Visualize the bars to progress in the way of the peasant whose allotted land is subdivided into a hundred long, narrow strips, some perhaps not more than four or five feet wide, scattered over the communal holding of some hundreds of acres in extent! Advancement on a general scale is as clearly beyond the powers of the individual as in a different way it is with the Kentucky mountaineer.

Appreciating the necessity for outside assistance the Russian Government has for the last ten years taken a hand in the solution of the problem. Much effective work has already been carried out by the land commissions and the peasant's banks. The former have been authorized to break up the communal holdings and redistribute the land in single blocks. With the banks they also arrange for the provision of farm buildings, implements, and other requisites for the peasant starting on his new career. Several instances of the success of the movement are related in the May, 1916, number of *Russia* (R. Martens & Co., New York). They have been drawn from the official publication "Les Travaux des Commissions Agraires (1907-1911)," St. Petersburg, 1912.

The Economic Divisions of Albania. We are indebted to Italian interest in Albania for a gradually increasing knowledge of this ill-known principality. A summary of the results attained by the Italian Scientific Mission sent to Albania in 1913 by the Società pel Progresso delle Scienze is given in the May, 1916, issue of the *Rivista Mensile del Touring Club Italiano* (pp. 290-292). From the standpoint of human occupation the land of Albania is divisible into four distinct zones extending from the summits of the inland uplifts to the shores of the Adriatic.

The highest of these zones comprises the limestone region of central Albania. It is extremely rugged and sparsely populated. Dotting the slopes between gorges and breaks are found rough shepherds' huts, the *stanni* of local appellation. Near the summits and the crested ridges, the built-up type of habitation gives way to the natural cavern or grotto, a not infrequent characteristic of this karst-like district.

The zone immediately below is that of the hilly country fringing the mountainous area. It extends over the best part of central Albania and rarely rises above 2,300 feet (700 meters). In its northern section it is characterized by a type of stone house which is well developed in the valley of the Tirana River. The lowest reaches of the zone contain the *chiflik,* or ranch type of habitation, consisting of a dwelling built centrally with reference to its appurtenances of fields and orchards. This zone is favorable for corn growing as well as for olive and tobacco cultivation.

The *chiflik,* however, is more typical of the succeeding zone, which is essentially a farming region of plains and valleys. The Musakia valley and the plain of Elbassan, a former lake-bed, are characteristic districts of the zone. Practically each valley has its urban center, sometimes—though this is exceptional—with a population as great as from five to ten thousand souls.

The last zone consists of the coastal strip of Albania. It is not thickly populated except around the ancient harbors. Sand dunes have often proved an obstacle to settlement. As a rule trade has fostered occupancy of the region, and the chief centers are found at the heads of the natural land routes, which, in antiquity, reached the heart of the Balkans by way of exceedingly arduous lines.

AFRICA

New Evidence on the Age of the Zimbabwe Ruins of Rhodesia. Dr. Randall-MacIver's theory ("Mediaeval Rhodesia," London, 1906) on the age of the Zimbabwe ruins is supported by a new line of evidence brought forward by the Rev. Samuel S. Dornan (Rhodesian Ruins and Native Tradition, *South African Journ. of Sci.,* Vol. 12, No. 11, 1916). In opposition to the theory advocated especially by R. N. Hall ("Prehistoric Rhodesia"), wherein the ruins are accredited with an age not later than 900 A. D. and attributed to Semites or Semitic influence, the former theory makes them of medieval or post-medieval age and of Bantu origin, reduces them in fact to the "level of a glorified Kafir kraal." Heretofore evidence has been solely archeological. Because of the difficulties of obtaining it, native tradition has been supposed lacking and its possibilities ignored. Mr. Dornan points out that natives now living in the vicinity of the ruins are not necessarily those who know the most about them. Within the last three hundred or five hundred years the population of Rhodesia has seen many changings and shiftings as a result of migrations of tribes from across the Zambesi and of more recent Zulu incursions. By means of patient investigation among the Makaranga tribe several traditions have been secured, and these confirm the supposition that Zimbabwe was "built by natives, inhabited by natives, and recently abandoned, probably not more than three hundred years ago."

Pastoral Control in the Transkei Territories of the Cape Province. A sudden crisis or catastrophe in the life of a people affords a test of the strength of the geographic controls by which it is governed. Three times within the last sixty years such a test has demonstrated the high importance of the pastoral control among the natives of the Transkei Territories in the eastern part of the Cape Province (Rev. J. R. L. Kingon: The Economics of the East Coast Fever as Illustrated by the Transkeian Territories, *South African Journ. of Science,* Vol. 12, No. 6, 1916).

In the middle of the last century the extraordinary delusion of the rebellious Amaxosa, involving the slaughter of their entire herds, led to the death or emigration of thousands. At the end of the century rinderpest carried off ninety per cent of the cattle and entailed proportionate suffering on the populace, and now, during the last few years the territories have been swept by another fatal cattle disease, the East Coast fever. The loss has been tremendous. Some idea of its magnitude may be gained from the fact that 23 out of the total of 27 districts have been involved and that in the five of them alone from which official estimates are forthcoming the direct loss in cattle has been placed at £1,250,000.

But this represents only a portion of the financial loss, and the effects of the disaster have permeated the whole physical and mental as well as the economic life of the people. With mealies and Kafir beer, milk forms the staple of native diet. Reduction of the milk supply produced an immediate effect in increased infant mortality. It also put a strain on agricultural resources, as yet little developed for a people who number 50 to the square mile. Moreover, both allied and unconnected events combined to diminish even the usual productivity of the land. Manure was lacking and cattle were unavailable for ploughing and the consequences of shallow planting magnified the effects of the serious drought that obtained during 1912. The native farmer, with his harvest commonly pledged for former debts, was thus compelled to buy back necessities at exorbitant prices. In addition, the dislocation of traffic impeded help that might otherwise have been forthcoming. Although the railroad mileage is being extended and motor vehicles are entering into general use, the ox-cart still remains the ordinary medium of transportation. The shortage of oxen and still more the stringent regulations created to prevent the spread of infection paralyzed communication.

Again, cattle constitute the native savings bank: they are the common form of investment. With their decrease not only was the purchasing power of the people curtailed but debts could not be paid and morality suffered. The moral effect penetrated deeper. The ceremony of marriage requires a payment in cattle by the bridegroom to the father of the bride. In cases where the requisite number of cattle could not be obtained immoral relations were apt to result, though, on the other hand, the practice of polygamy was greatly curtailed. Yet the consequences of the plague were not wholly evil: one may note the effect on education. By it many herd boys were set free for unwonted schooling. Native relations with the Government were not so happy. Measures to cope with the epidemic naturally fell heavily upon individuals and were often misunderstood. Police duty was increased, and in extreme instances military force had to be employed.

It is not improbable that this blow to pastoral life may favorably influence the new agricultural movement that is already being felt in the territories (Rev. J. R. L. Kingon: Native Agriculture, *South African Journ. of Science,* Vol. 12, No. 5, 1915.) It is true that the native has been and still is very wasteful. He has destroyed much of the original forest and its animal population. In his cultivation he clings to the old tribal customs. His staples—mealies, Kafir corn, pumpkins, beans, and sugar-cane —are sown together, broadcast and indiscriminately; ploughing is seldom done to an adequate depth; rotation of crops is not followed and irrigation is scarcely developed, in spite of the liability of droughts such as that of 1912. Underlying many of the native practices one still finds the old fear of witchcraft. Many yet attribute a good harvest to a good ''medicine'' rather than to proper cultivation. But the spread of agricultural education and the change in land ownership encourage hope for the gradual transformation of the primitive tribal ideas and methods. As the Government surveys progress land is gradually passing from communal to individual tenure, the practice of enclosure is growing, and with it the possibilities of better agriculture.

ASIA

A Numerical Estimate of the Christians of the Turco-Persian Border. Attention to the plight of the inhabitants of the Turco-Persian boundary zone has recently been attracted by the outrages to which they have been subjected through the lawlessness prevailing in the region. Thanks to the zeal of missionaries stationed at various points in the valley of the Tigris and in the lake region of the Armenian highlands it is now possible to reach a likely estimate of the number of the Assyrian Christians, more frequently referred to as Nestorians, and related groups. The statistics derived from native sources by missionary efforts have been collected recently by Dr. W. W. Rockwell in a pamphlet entitled ''The Pitiful Plight of the Assyrian Christians in Persia and Kurdistan,'' published by the American Committee for Armenian and Syrian Relief, New York, 1916. According to this document the Christian element in the valley of the Tigris around Mosul comprises twelve thousand families aggregating 71,652 inhabitants. The majority consists of Roman Catholic Uniats. An important group is made up of Jacobites, some 11,400, who are descendants of the followers of the church organized by

Jacob Baradai in the second half of the sixth century. Four thousand of these Christians are Nestorians.

In the highlands of Kurdistan the 92,000 tribal or semi-independent Christians are mainly Nestorians. The largest community occupies the Tyari region. On the Persian side, in Adarbaijan, between 30,000 and 35,000 Christians are scattered in the Lake Urmia region, especially in the valleys of the three short rivers which empty into the lake from the west. Altogether the number of Assyrian Christians is estimated at 198,452. In this aggregation 115,800 recognize the Mar Shimun, or patriarch of the Nestorians, as their leader.

Sir Aurel Stein's Latest Expedition in Central Asia. In the August and September, 1916, numbers of the *Geographical Journal* Sir Aurel Stein outlines the main results of his latest expedition, conducted on behalf of the Indian Government in the western Gobi, Chinese Turkestan, the Pamirs, and Seistan in eastern Persia. During the two and a half years so spent (August, 1913, to February, 1916) the explorer traveled over 11,000 miles, acquired a rich archeological collection and much material of geographical and historical interest, and with his assistants surveyed and mapped some hundreds of square miles of territory, part of which had never before been seen by European eyes. Notices of the earlier operations of the expedition have appeared in the *Bulletin of the American Geographical Society* (Vol. 46, 1914, pp. 531 and 771; Vol. 47, 1915, pp. 533 and 774-775). They extend from the start of the expedition in Kashmir to its most easterly field in the Pei-Shan Gobi of southwestern Mongolia. Some of the important events of the later journeys are here summarized.

November, 1914, saw Sir Aurel and his assistants in the depression of Turfan in the northeastern corner of Chinese Turkestan. Much detailed research was carried out here, for, as is well known, this basin, like its larger counterpart, that of the Tarim, is of critical importance in the interpretation of climatic change and human relations. With this in view a detailed survey was made on the scale of one mile to the inch. Several excavations were conducted, one at Idikut-shahri, long ago identified as the site of Kao-chang, the capital of Turfan in the seventh to eighth centuries A. D., when the region was an important Chinese administrative center and a great trading place between China and Western Asia. In Turfan the explorer was joined by his surveyor Lal Singh, who had carried his triangulation to the vicinity of Lou-lan in the Lop Desert. Later Lal Singh connected this work with that done in the Kwen-lun and thence via the Kuruk-tagh with surveys in the Tien-shan.

Striking south by the now unpopulated country of the rugged Kuruk-tagh, Sir Aurel followed the line of oases along the southern base of the Tien-shan to Kashgar. His archeological finds convinced him that the area under cultivation in Buddhist times was in excess of the present irrigation resources, which he carefully measured. The Kashgar River was pursued to its western headwaters and the divide crossed to the Alai valley, on the old road of the Chinese silk traders to the Oxus. Thence a little-known route was selected southward across the Pamir plateau over great glacier-clad ranges presenting valuable data on recent glacial retreat. From Lake Victoria, in the heart of the Pamirs, the famous legendary source of the four great rivers of Asia, the upper Oxus valley was followed on the Russian side. In the region inhabited by the Wakhis modern economic development claimed attention on account of the material progress made by these people, now secure alike from Kirghiz raids and Afghan exactions.

From the upper Oxus rapid marches through Bokhara brought Sir Aurel to Samarkand and the Russian Central-Asian railway, on which he proceeded to Ashkabad on the border of the Persian plateau. Crossing this southward he arrived in November, 1915, in Seistan, the self-contained basin on the Persian-Afghanistan boundary, a plane-table survey on the scale of four miles to an inch being made en route. In Seistan discoveries of Buddhist remains proved the previously suspected Iranian link connecting the Greco-Buddhist art of northwestern India with the Buddhist art of Central Asia and the Far East. From Seistan the return to India was made through the Baluchistan desert: Srinagar was reached in the middle of March. There the vast amount of archeological material collected will undergo preliminary examination and arrangement prior to removal to its permanent home in the Museum of Indian Art and Ethnography at Delhi.

Rainfall and Crops in India. Increasing attention is being paid to relations between weather and crops. This is a practical application of meteorological data which suggests many future economic possibilities. In India, with its dense population and its extremely critical monsoon rainfall, much interest is naturally taken in such investigations. A recent number of the *Memoirs of the Indian Meteorological Department* (Vol. 21, Part 14, 1916) contains a discussion of the correlation of rainfall and the succeeding crops, with special reference to the Punjab, by S. M. Jacobs. The area selected for study, in the Doab, between the rivers Beas and Sutlej, has no canals and, as a rule, very little flooding. The problem of rainfall effect is, therefore, comparatively simple. It is clearly recognized that the complexity of the question of forecasting the crop is very great. The area sown, for example, is determined by such factors as the price of seed, labor, population, mortality, standard of living, and political changes. Nevertheless, unless the fluctuations of these contributing causes are unusually large, the rainfall control stands out clearly enough. The determination of the yield per acre is less of an economic problem and more purely one of meteorology, soil physics, and plant biology.

The predictions thus far made of the sown area show a distinctly close correspondence between observed and calculated results, the probable error being 5.6 per cent of the mean. The predictions of the crop, based on a formula developed by the author, show a close agreement with the actual conditions. The author concludes that this method of correlation makes it possible ''to establish prediction formulæ of both sowings and yield which represent with accuracy the effect rainfall has on crops.'' While the formulæ might ''undoubtedly be improved,'' they already have a practical value ''which modern statesmanship cannot afford to ignore.'' R. DeC. Ward.

AUSTRALASIA AND OCEANIA

Upper Air Research in Australia. The first report on upper air research in Australia has been published (*Commonwealth Bureau of Meteorol. Bull. 13,* Melbourne, 1916). Difficulties have been encountered owing to the fact that Melbourne is on the south coast of Australia and the prevailing winter winds, as well as the upper currents in advance of cyclonic disturbances, are from a northerly direction, and thus carry the balloons out to sea. The work has been greatly curtailed because of the war and the consequent enlistment of many officers with the Australian Imperial Forces. The first ascents of *ballons sondes* were made in 1913, and there were fifteen in all, ending in May, 1915. The balloon track and the accompanying weather conditions are charted for each ascent, together with ''altitude-graphs'' showing the temperatures recorded. The general conditions for this work have been so unfavorable that nothing but preliminary results are to be expected. The mean height of the ''isothermal layer,'' or stratosphere, above Melbourne is 10 kilometers. R. DeC. Ward.

Extension of the Boundaries of the Gilbert and Ellice Islands Colony. The *Board of Trade Journal* for May 25, 1916, reproduces an Order-of-Council dated January 27, 1916, from the *London Gazette* of May 19, according to which the boundaries of the Gilbert and Ellice Islands Colony are extended so as to include Ocean Island, immediately west of the group, and Fanning and Washington Islands, several degrees to the east. A later order, dated February 29, effected the further annexation of the Union Islands to the southeast, with all small islands, islets, rocks, and reefs depending on them, to the Gilbert and Ellice Islands Colony. A notice concerning the original group appeared in the February, 1916, number of the *Review,* p. 145.

PHYSICAL GEOGRAPHY

The Melting of Snow. A study of the melting of snow at Albany, N. Y., has been made by Mr. Robert E. Horton. The period of observation covered February-March, 1914, and the changes in depth, density, and water-equivalent of the snow accumulation were noted. The subject is an important one for engineers, as well as for meteorologists. A number of conclusions are reached, among which a few may here be noted. If snow melts at the surface, or if warm rain falls on it, most of the water percolates down through the body of the snow, provided the latter is at about 32° Fahrenheit, and a part of the water adheres to the snow crystals as a capillary film. When snow overlies unfrozen ground, or frozen but porous and unsaturated soil, most of the water from melting percolates to the bottom of the snow layer, and thence into the soil. The melting of snow or warm rain falling upon a snow cover under suitable conditions is thus more favorable to the replenishment of ground water than would be an equal volume of rainfall on a bare surface, since, in the presence of snow, surface run-off is greatly retarded and the opportunity for infiltration increased. Under suitable conditions, especially in woods where the ground is least frozen, a deep layer of snow on level ground may wholly disappear by invisible percolation without causing any run-off whatever (*Monthly Weather Rev.,* Vol. 43, 1915, pp. 599-605). R. DeC. Ward.

The Origin of Cyclones and Anticyclones. In a recent paper on ''The Local Circulation of the Atmosphere'' (*Monthly Weather Rev.,* 1916, pp. 182-186), W. H. Dines concludes that the known relationships between pressure and temperature are explicable on simple dynamic principles if the disturbance is supposed to start at 8 or 9 kilometers and to spread downward, resulting in the production of the familiar surface phenomena. It is not yet clear how the upper winds which blow around a certain region start, or strengthen, or cease. But it is certain that, however a low-pressure area is produced, it is not due to the high temperature of the air above it. R. DEC. WARD.

GEOGRAPHICAL NEWS

PERSONAL

MR. EDGAR J. BANKS, field director of the Babylonian Expedition of the University of Chicago to Bismaya, gave a lecture on December 8, 1916, before the Geographic Society of Chicago entitled "A Thousand Miles down the Tigris River."

MR. C. WILLIAM BEEBE, curator of ornithology of the New York Zoölogical Society, read a paper on December 18, 1916, before the New York Academy of Sciences on "Zoölogical Studies of British Guiana."

PROFESSOR A. P. BRIGHAM of Colgate University will give two courses at the coming Summer School session at Columbia University: (1) Geographic Influences in American History; (2) Geography of New York State.

PROFESSOR NATHANIEL L. BRITTON, director-in-chief of the New York Botanical Garden, on the occasion of the annual meeting of the New York Academy of Sciences on December 18, 1916, presented a report on the progress of the natural history survey of Porto Rico which is being conducted under the auspices of the New York Academy of Sciences (see *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 210-211).

MR. HENRY G. BRYANT, president of the Geographical Society of Philadelphia, on the occasion of the celebration, on December 6, 1916, of the twenty-fifth anniversary of the founding of the society, addressed the members on "Men and Members of the Early Days of the Society."

PROFESSOR REGINALD A. DALY of Harvard University read a paper at the twenty-ninth annual meeting of the Geological Society of America at Albany, December 27-29, 1916, on "New Test of the Subsidence Theory of Coral Reefs."

PROFESSOR ELIZABETH F. FISHER of Wellesley College gave an illustrated lecture on November 28, 1916, before the Appalachian Mountain Club of Boston on "The Contrasted Scenery of the Sierra Nevada and Rocky Mountains."

PROFESSOR J. PAUL GOODE of the University of Chicago gave a lecture on January 3 before the Geographical Society of Philadelphia on "The Geographic Causes of the Great War."

PROFESSOR D. W. JOHNSON of Columbia University addressed the Germanistic Society of America on December 15 on "Topographic Features as an Influence in the European War" and the American Philosophical Society of Philadelphia on January 5 on "The Strategic Geography of the Balkan Campaign."

MR. CHARLES KEYES read a paper at the twenty-ninth annual meeting of the Geological Society of America at Albany, December 27-29, 1916, on the "Orographic Origin of Ancient Lake Bonneville."

PROFESSOR E. M. LEHNERTS of the University of Minnesota will give two courses at the coming Summer School session at Columbia University: (1) Map Interpretation; (2) Field Work in Physiography (in the metropolitan district and Hudson River region).

PROFESSOR HARRY FIELDING REID of Johns Hopkins University read a paper at the twenty-ninth annual meeting of the Geological Society of America at Albany, December 27-29, 1916, on "Geometric Plans of the Earth, With Special Reference to the Planetesimal Hypothesis."

DR. HERBERT J. SPINDEN of the American Museum of Natural History read a paper on December 18, 1916, before the New York Academy of Sciences on "Ethnic Relations between Venezuela and Porto Rico."

PROFESSOR FREDERICK STARR, associate professor of anthropology at the University of Chicago, lectured on November 10, 1916, before the Geographic Society of Chicago on "Aztec Mexico."

MR. NORMAN TAYLOR of the Brooklyn Botanic Garden announces a course on phytogeography at that institution. The course will deal with plant distribution. Prerequisites are courses in plant ecology and geology and a good general knowledge of climatology and systematic botany.

DR. TALCOTT WILLIAMS, director of the School of Journalism of Columbia University, on the occasion of the celebration, on December 6, 1916, of the twenty-fifth anniversary of the founding of the Geographical Society of Philadelphia, addressed the members on the "Past and Future of the Society."